commodore
PET USERS CLUB NEWSLETTER

Volume 2

Issue No. 1

Editorial

Welcome to Volume 2. Issue 1.!

The Pet Users Club is now in its second year of operation and is still growing. Membership is now around 2000 with more subscriptions coming in all the time.

This issue contains the first in a series of articles entitled "An Introduction to Machine Code", the most requested addition in the Pet Users Club survey. Also printed are two more reviews of Pet-related books.

Many thanks to the contributors to this issue; articles and programming routines are now trickling in steadily. Since we now have a lot of new members, it should be explained that the PUC depends on your contributions. If you can write anything about your application, programs or specialist hardware, please send it in.

Finally, this is the last issue for which I shall be Editor and Andrew Goltz will be taking over for the time being. The Pet Users Club will continue to be based at:-

360 Euston Road
London NW1 3BL.

Richard Pawson

Commodore News

NEW - COMMODORE TRAINING DIVISION

In keeping with our philosophy of continuous expansion and development of support activities, Commodore is about to commence a series of training courses on the use of Pet and its associated peripherals.

The courses are residential and of two or three days duration. A number of venues have been fixed, at different places across the country, in order to make the courses available to as many Pet users as possible.

All different types of user will be catered for, including ; business, scientific, educational and private use, though it is by no means necessary to own a Pet to benefit from them. The first two titles have been fixed as "Primary Basic" and "Disk Utilisation", with more to follow in 1980, such as "Advanced Basic" and "Interfacing".

There will be one Pet between each two students on the course, with small tutorial groups - a method of teaching already proven to be successful. Mike Gross-Niklaus (who has recently joined Commodore) will be supervising each course personally. Mike is well experienced at computer training, both with large systems and more recently with Pets in particular; he has also been contributing to this newsletter for some time now.

Overleaf is a list of dates and venues for the last quarter of this year. Please note that we can only accept official company orders. All other bookings must be accompanied with payment.

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ENDORSEMENT SCHEME

This scheme, which was mentioned last issue, is now well established. You will probably have seen the "Commodore Approved" signs in your local dealer or magazine advertisements. Included with this newsletter you should have received a leaflet giving more details. Items already on the approved list include; interfaces, business suites, field maintenance contracts, books and firmware etc.

Commodore Training Courses — October to December 1979

Date	Course	Venue	Price With accom.	Without accom.
Oct 22-24	Primary Basic	Skyway, London	£225	£175
Oct 25-26	Disk Utilisation	Skyway, London	£125	£100
Oct 29-31	Primary Basic	N. Stafford, Stoke	£225	£175
Nov 1-2	Disk Utilisation	N. Stafford, Stoke	£125	£100
Nov 5-7	Primary Basic	Excelsior, Glasgow	£225	£175
Nov 8-9	Disk Utilisation	Excelsior, Glasgow	£125	£100
Nov 12-14	Primary Basic	Skyway, London	£225	£175
Nov 15-16	Disk Utilisation	Skyway, London	£125	£100
Nov 19-21	Primary Basic	N. Stafford, Stoke	£225	£175
Nov 22-23	Disk Utilisation	N. Stafford, Stoke	£125	£100
Dec 3-5	Primary Basic	Excelsior, Glasgow	£225	£175
Dec 6-7	Disk Utilisation	Excelsior, Glasgow	£125	£100
Dec 18-21	Primary Basic	Post House, Coventry	£225	£175

All courses start at 10.00 a.m. on Monday or Thursday.
Primary courses end at 3.30 p.m. on Wednesday.
Disk courses end at 12.30 p.m. on Friday. Prices are inclusive of VAT.

These are intensive small group courses involving full evening sessions and you are strongly advised to book *with* accommodation.

All accomodation is in top class Trust House Forte hotels where the actual courses take place. Single rooms with private bath and full board are standard. Bookings will be accepted on a first come basis.

Further courses on other topics will be run in the future. Full details of these and other PET developments will be published in the PET Users Club Newsletter, available for an annual subscription of £10.00 from the PET Users Centre, 360 Euston Road, London NW1 3BL.

BOOKING FORM

Please underline course required: Basic Basic Disk Programming

Date required:.....(1st choice).....(2nd choice).....(3rd choice)

Name(s) .....

.....

.....

.....

Address..... I enclose my cheque no: .....

..... for £..... (or official

..... Company Order (no:.....)

Signature ..... Date .....

Please remit full payment or official company order — no cancellations can be considered within two weeks of the course starting date.

Please return to:
Commodore Systems PET Users Centre,
360 Euston Road, London NW1 3BL.

Software Notes

FUTURE TAPE RELEASES

Future additions to Commodore's cassette library will include programs on stock market trends, fast fourier transforms, logic circuit models, education in chemistry, analysis of cassette tapes and visual reports on any errors present, fantasy games and more besides. For full details of these new releases see the next edition of this newsletter and also our new master library catalogue (coming out shortly).

Our disk unit is now becoming widely accepted as a powerful addition to the Pet system. Because of the nature of its facilities and commands the disk requires careful use if it is to function correctly. Several users have experienced difficulties with the error light appearing on initialisation. This problem has been traced to incorrect centralisation of the media - the correct procedure is detailed below.

We are taking a number of steps to increase the documentation and education available on the disk - a new manual is being supplied with all subsequent shipments and and printed elsewhere in this newsletter is a copy of our disk utility program.

DISK INITIALIZATION

The disk should be carefully centred in its envelope before insertion and most important of all, the door of the drive should be left open for 1 - 2 seconds as initialization proceeds. The effect of leaving the door open during the early stages of initialization is to allow the disk to settle into its optimum physical position before reads or writes are attempted.

In a few weeks we will be announcing the first release of software for the disk. Titles will include an Assembler, an Editor, LISP and the first of our Business Packages. These will include a Business Filing System and a Stock Recording with Invoicing suite and a Word Processor.

Ledger programs are complete and now being exhaustively tested.

As usual, may I ask you not to contact us about these products until an official announcement is made. Full descriptions of these products in the next issue and, of course, the results of the Star Trek competition.

The rest of this column is devoted to description of a fix for garbage collect problems.

NEW from the... Petsoft Catalogue

Simulations and Games

NEW **BLITZ £5** A video game in which you command an anti-aircraft battery defending London. A direct hit on a falling bomb scores you 20 points, on a bomber 30 points. However, you lose 100 for every building destroyed.

NEW **BREAKTHROUGH £5** Classic video game with a moving gun shooting bricks out of a four layer wall; when you have made a hole through all four layers, you shoot one more bullet through the hole to win. Three speeds of play, each with a limit on the number of shots. N.B. Fast speed is very difficult but achievable. Program can be modified to vary speed and wall thickness.

NEW **BULLS & BEARS £9** Jeff Boetticher, Head of the American Byte Shop chain, reckons this is the best micro computer game available anywhere. Each player starts with $50,000 to invest on the stock market. By manipulating shares in the companies you control and keeping a tight rein on the production side, it is possible to become a millionaire. Revised and improved U.K. version.

NEW **HEXAPAWN & FRAMEDART £5** HEXAPAWN is played with two sets of three pawns on a 3x3 board, the object being to reach the other side or to prevent the computer from moving. Be warned — PET learns from its mistakes and improves its play each game. FRAMEDART generates a constantly changing screen pattern to relax you after Hexapawn.

NEW **HUNT £10** A new concept in fantasy simulations which has achieved wide acclaim. "The context is that of a search for a defined object, typically Atlantis or the Holy Grail. The objective, the names and natures of the searchers, their antagonists and the properties of the space in which the hunt is conducted are defined — by you!" — Practical Computing.

NEW **MAXIT! £5** An ingenious board game played on 8x8 board. You can only move horizontally whilst PET is allowed vertical moves only. Warning: PET's strategy is very cunning.

NEW **THREE OF A KIND £4** The computer selects nine words. You and PET take turns to pick one out, the object being to get three of the same letters into your word selections. A real brain boiler!

NEW **SUB SEARCH £4** A new submarine-hunting game with dynamic graphics. Save the convoys by depth charging enemy U-boat

NEW **THE MONEY GAME £5** Your chance to invest on the stock market and the turf. Fortunately, rich uncles die regularly leaving you shares. You may get away with not declaring your gains — or you might be arrested!

NEW **MOTOR RACING £6** Exciting race track simulation. Controls include accelerator, brake and steering. Good graphics.

NEW **PARTY PACK £5** Children love this package which includes GUESS THE NAME, where your clues include the first letter and sex of the name, and SNAP with variable speeds. CONSEQUENCES displays a random series of sentences describing who meets who, what they do, and the results. The sentences can be personalised to intriguing effect.

NEW **PET POETRY £5** We think the poetry generated from PETs data files — which you can easily amend — is as good as most of the rubbish that gets published nowadays.

NEW **SCRAMBLE** The computer generates anagrams of well known words for you to unravel. Not nearly as easy as it sounds. Crossword puzzle addicts will adore this.

NEW **SOLITAIRE £4** Now you can play this famous game on the PET. If you make a mistake, cheat a little and have the computer back step a few moves.

NEW **SPACE SHUTTLE £5** Can you manoeuvre your NASA shuttle to dock with an orbiting space station before you run out of fuel? Highly rated by all computer space afficionados.

NEW **STEEPLECHASE £5** All the thrills of the National Hunt. Meet 'Honest Joe' the punter's friend, and lose your shirt on the horses. Very good graphics. Start with £1000 and take your chance.

NEW **TILES £5** A challenging graphic game which requires you to move one large square amongst a number of smaller squares from one side of the board to the other and back. It takes PET 138 moves — can you do better?

Educational Mathematical and Scientific

NEW **BIOLOGY MULTIPLE CHOICE £6** C.A.I. program tests and stimulates knowledge of: Bone Structure of Birds, Calories, Bone Structure of Humans, Plant Structure, Protein in Urine, Eggs and Food, Glucose in Blood, Calorific value of Fats in Blood, Temperatures and Enzymes, Parts of the Plant, Human Body Temperature, Fungus, etc.

NEW **CALCULATOR £5** Comprehensive simulation converts numeric keypad into a four function calculator with memory and automatic constant. Features include fixed or floating decimal point, with round off or down. A calculator display is shown on screen and all steps are listed. Alternatively, a printer may be used to turn the PET into a powerful printing calculator.

NEW **CHEMISTRY TUTOR £7** Comprehensive tutorial dealing with atomic numbers, element symbols etc. Choice of difficult or easy questions.

76 COMMON BASIC PROGRAMS £15 A collection of 76 useful programs on one cassette from Adam Osborne's best selling book. These include personal finance, maths, statistics and general interest topics. Excellent value for stand alone or incorporated use.

NEW **COURSE HANDLER £95** A must for School Timetablers. The program handles all the information relevant to creating a 4th/5th or 6th year Option Scheme and is particularly useful where an "Open Choice" of subjects is offered to pupils. The program maintains, via a simple dialogue with the timetabler, a file of pupils and their requests and allocations and a file containing details of the Option Scheme. Facilities are provided for viewing the scheme, the classes, the pupils and the class clash matrix. The COURSE HANDLER will fit the pupils against the scheme by 'Best Manual Package' method but these assignments may be overridden by the timetabler if they are unsuitable. Further, pupils may be selected for editing by class or name for final adjustments to their choices. Described by users as "A great asset" and "A very useful tool". Suitable for a PET with 32K bytes and two cassette recorders. Full 65 page manual supplied.

NEW **CRYPTO PACK £8** This is the complete kit for all those interested in cryptography, codes, ciphers and cryptanalysis. Developed by Dr Michael Richter, the package includes Cryptosub, General Cipher, Cryptanalyser and New Cipher programs.

NEW **FREQUENCY RESPONSE £5** You enter the Constant, Finite Delay in L, Sec, number of zeros of transmission function. Frequency response is radians/second. Range option: octaves, halfoctaves or equal octaves. The program calculates cycles/second, radians/second, amplitude ratio in decibels and Phase in degrees, from the information entered. Print out function included.

NEW **MATHADAPT £5** Written by 'Kilobaud' PET columnist, Greg Yob, to develop basic maths skills, the program sets problems for Addition, Subtraction, Multiplication and Division, and marks a report card. However, *this* program gives you control on both problem limits and their difficulty.

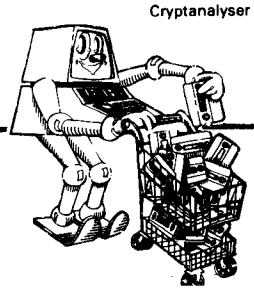
NEW **PHOTOGRAPHY TUTOR £12** A comprehensive course developed by a professional photographer making full use of PETs dynamic graphics capabilities to demonstrate and explain the mysteries of exposure, focus, aperture, shutter speeds, interchangeable lenses, depth of field, etc. The theory and practice of photography are explored interactively, and progress tested. Multiprogram pack. Available on Disk £15.

NEW **PHYSICS MULTIPLE CHOICE £7** Clearly written program which tests and scores knowledge of electricity, Amps, Ohms, Volts, Galvanometers, Lenses, refraction of light, colours, magnetism, velocity, Newtons, Pulleys, measurement of humidity, convection, pendula, cathode rays, etc.

NEW **TRANACTIONAL ANALYSIS £7** An introduction to T.A.—a system for understanding human behaviour. Chapters include: You As A Person, Stroking, Transactions, Are You Listening?, The Balancing Game. This interactive learning cassette will help you gain a better understanding of why you get along with some people and not with others, and may give you a better understanding of yourself! Documentation included.

NEW **FRENCH/ENGLISH TUTOR £6** The computer tests your language skills from English to French and French to English. Answers included, of course.

Continued



ACT Petsoft LTD.
Radclyffe House, 66-68 Hagley Road,
Edgbaston, Birmingham B16 8PF. Tel: 021-455 8585 Telex 339396

NEW from the... Petsoft Catalogue

Business Programs

NEW **HOUSEFINDER £25** Professional package developed specially for Estate Agents. Details of properties on the register are encoded under Aea (up to 34 are handled), type of house, situation, No. of reception rooms, bedrooms, garden size etc. Modes include Enter or Display Details, Find Property, Save Files, Load Files, etc.

NEW **JOB EVALUATION £25** Conducts the evaluation necessary to establish pay structures and grades. Program computes correct weightings for factors — education, training necessary, responsibility over other men and equipment, working conditions etc. — which comprise job value. A Job Evaluation Formula is created for use as a guide to the relative value of a job *based on the thinking of the company or department concerned.* Answers to paired comparison tests with other jobs are analysed. The names of the factors for which weightings are given, are then requested and the comparison procedure activated. Multiple Regression Analysis is invoked to find the set of weightings best fitted, and display them in the form of a Job Evaluation Equation. Full documentation included.

NEW **ROUTE PLANNERS:** France, Spain, Italy, Western Europe Trunk Routes — £5 each.
Enter your present location and destination and PET searches its database for the most efficient route. The names of towns, distances etc. are displayed.

NEW **PAYROLL — 400 (Disk) £50** A totally new and complete disk based payroll system designed and written to meet the needs of small businesses. Up to 400 employees per disk are catered for. A 32K PET 2001-32 equipped with Commodore dual floppy, an Annadex DP800 or device 4 printer is required.
Ease of use, security and versatility are key points in this system. Facilities provided include Holiday Pay, Sick Pay, Bonus payments and two rates of overtime, as well as allowing a "standard week" to be specified for each employee. Weekly and monthly summaries are provided and amendments necessary because of a Budget (e.g. increasing employee's tax codes) are made very easy. Each week a wage slip is printed for each employee followed by an analysis of the coins/notes required for these employees paid in cash (payments by cheque and credit transfer are also allowed for). Tax and N.I. are computed automatically from a knowledge of the tax code and N.I. rate applicable to that employee. All tax codes and N.I. tables A, B and C are catered for. As well as being simple and time saving to use, the system is designed to be "operator proof" and the security prevents unauthorised amendment of details on file. Versions of this system for other disk drives and printers will be available shortly. Update service available.

NEW **STOCK CONTROL ON DISK £25** Facilities allow full or operational stock print out, total costing of items in stock and re-order level warning. Data is stored under Reference, Description, Supplier, VAT Rates, On order Quantity, Quantity in Stock, Unit of Quantity Designated, Minimum level, Stock allocated, Sale Price and Purchase Price. Approx 400 items per diskette.

Programming Aids and Tutorials

NEW **AUTO LINE NUMBERER £5** Write your programs without bothering about line numbers. Automatically supplies the next line number when you hit Return. Increment and starting point specifiable by user. May also be used for deleting blocks of lines.

NEW **BUTTERFIELD'S ENCYCLOPAEDIA £12** A treasure trove of utilities and games from the PET's leading exponent, Jim Butterfield. Includes Copycat, to prevent tape copying, Tape Test, Morse Practice, Triangle, Calculator, Metric Conversion, Data Finder, Trendline, Mileage, Factors, Keyboard Record, Battleships, and many more. Outstanding value.

NEW **6502 FORTH £30** FORTH is a unique threaded language that is ideally suited for systems and applications programming on a PET. The user may have the interactive FORTH Compiler/Interpreter system running stand-alone in 8K to 12K bytes of RAM. The system also offers a built-in incremental assembler and text editor. Since the FORTH language is vocabulary based, the user may tailor the system to resemble the needs and structure of any specific application. Programming in FORTH consists of defining new words, which draw upon the existing vocabulary, and which in turn may be used to define even more complex application. Reverse Polish Notation and LIFO stacks are used in the FORTH system to process arithmetic expressions. Programs written in FORTH are compact and very fast. System features and facilities include Standard Vocabulary with 200 words, Incremental Assembler, Structured Programming Constructs, Text Editor, Block I/O Buffers, Cassette Based System, User Defined Stacks, Variable Length Stacks, User Defined Dictionary, Logical Dictionary Limit, Error Detection and Buffered Input.

NEW **SYSTEM EXTENSION £12.** Allows you to store up to 10 separate Basic programs in RAM at once for instant individual retrieval. Includes Block Delete program linker and Fast Line Renumberer. Crash prevention feature with special error messages. Suitable for old ROM PETs with expansion memory only.

NEW **FORMATTED LISTER £15.** Intelligible listings at last! Produces neat listings of Basic programs, which differ from the normal one in that the line numbers are right aligned, the listing is divided into numbered titled pages, and Basic lines too long to fit in the print width have their continuations indented clear of the line numbers. PET cursor control characters are printed as bracketed abbreviations e.g. (CLR) for "Clear Screen". For printers without lower case, shifted PET symbols are printed as bracketed upper case symbols. A blank line is printed as each line started with a REM statement. This allows separation of program line blocks.

NEW **MULTI KEY GET £4** How to make the PET recognize more than one key when several are pressed at once — essential for games. A demo is included in addition to the routine itself.

NEW **PILOT £10** The latest version of an additional language for the PET, especially suited to writing conversion programs and for Computer Aided Instruction. 15 easy-to-learn one-syllable commands handle the display of string, input commands, checking data against inputs, jumps to other program segments or sub-routines, returns from subroutines, special counters etc. The PILOT interpreter also accepts fundamental Basic commands including LOAD, RUN, NEW, STOP, SAVE Etc.

NEW **SCREEN STORE £4** Useful routine for storing the exact contents of the screen RAM. Can also be used with dynamic graphics.

NEW **SELF MONITOR £7** An essential debugging aid which allows you to see your own program execute line by line. Variables below line 999 are also checked. The routine can be automatically deleted from your program.

NEW **SOFTWARE MATHS ENHANCER £9** Software method of enhancing the maths capabilities of the PET, includes: RPN Calculator, Hex Arithmetic, Fourier Explicit, Non Unif, 78 Digit Multi, 255 Digit Multi, Small Primes and Large Primes.

HOW TO ORDER — From your local PET Dealer, or direct from us:

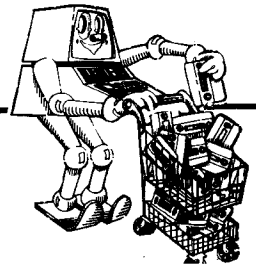
STRAWBERRY IMPERATIVE £2 (VAT free) An application book which provides a useful guide to the PETs PEEK and POKE commands. RAM locations up to 1023, screen RAM and locations above 59000 are examined in separate chapters.

THE GREEN SCREEN £8.50 A high contrast screen which reduces eye strain and enhances the look of the PET. Quick and easy to install.

We accept Access , Mastercharge, Barclaycard, Visa, Eurocard orders by telephone on 021-455 8585. Official orders are accepted from schools, colleges, government departments only.
All other orders should be accompanied by a cheque.

PLEASE ADD V.A.T. + 50p Post and Packing to your Order

Non-UK Sales We will, and do ship to any part of the world by airmail post. To cover the cost please add the equivalent of 25 pence (50 US cents) per title to destinations within Europe, and 50 pence (1 US $) per title elsewhere. All orders should be prepaid. We aocept Mastercharge, Eurocard, Bank Americard/Visa credit cards, cheques drawn on UK banks, and International Money Orders. Giro or Direct credit transfer may be made to our account.



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STRING FIX

There is a PET peculiarity (which is shared by all Microsoft Basic Machines), which can cause many problems - some of which might be thought to be due to the disk but are in fact due to the way strings are organised.

This is the problem of garbage collection which can cause a machine to "hang-up" or become unresponsive to the operator for long periods of time e.g. more than 130 seconds for the program below without the String Fix (which is in line 55).

From the tabulated results, it would seem strings are most quickly handled in this case with the top of memory set at N=23 (5.75K).

So, if long delays are encountered in programs handling strings, the remedy is to lower the top of BASIC to create a shorter stack.

Previously assigned strings may still be referenced, but all new assignments will now only be garbage collected to the new top of BASIC.

This can produce spectacular improvements in the performance of programs as the table above the listing suggests.

SECONDS	TOP OF BASIC (HI BYTE)
12.05	15
7.61	16
6.08	17
5.31	18
4.95	19
4.73	20
4.46	21
4.40	22
4.13	23
4.25	24
4.63	25
7.28	26

STRING FIX DEMO

```
 5 POKE53, 128:REM SETS TOP OF MEMORY TO 32K
 10 X=720
 20 OPEN3,4:OPEN4,4,1:OPEN5,4,2:PRINT#5,"99.99                    99"
 30 DIMA (X)
 40 FORI=ITOX
 50 A$ (I)=STR$ (I) + "XXXXXXXXXXXXXXXXXXXXXXXXXXXX"
 60 NEXT
 70 PRINT#3, "SECONDS      TOP OF BASIC (HI BYTE)"
 80 FORN=15TO26
 90 POKE3,N
100 T=TI
110 FORJ=1TO800
120 Z$= "ZZZZZZZZZZZZZZZZZZZ"+""
130 NEXT
140 PRINT  (100* (TI-T)/60)/100,N
150 PRINT#4, (TI-T)/60,N
160 NEXT
170 CMD4:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT"  STRING FIX DEMO"
                                                          :PRINT:

PRINT:PRINT:LIST
READY.
```

PAYROLL

We are producing a Payroll 2 in response to new regulations and recommendations that have recently come from the Inland Revenue.

This program will be supported by a different author to the last one and we will be announcing details soon.

All orders for Payroll received after September 1st, will be held until they can be supplied with Payroll 2.

Hardware

THE BASIC PROGRAMMERS TOOLKIT - A REVIEW

The Basic Programmers toolkit is a piece of firmware, developed specifically for the PET, in the States, and imported into this country by PETSOFT. Essentially the toolkit adds 10 commands to the PET operating system by means of a PROM containing a number of machine-code subroutines residing in the expansion ROM area of the memory map.

For the new 16 & 32K Pets, this PROM will plug straight into one of the expansion ROM sockets on the main logic board. For 8K Pets, the toolkit is mounted on a small driver board which plugs into Pet's expansion memory port and 2nd cassette port. After connecting and switching on, the toolkit is activated with one SYS command.

The features added by the toolkit are mainly used in the development and de-bugging of programs - hence the name. Although one or two of the routines are already available on cassette from other sources, the advantage of the toolkit is that they are constantly available and do not use up your working RAM.

The toolkit comes with extensive documentation, including a list of 'GOTCHAS' (situations in which mis-application of the command results in errors).

The following is a list of the commands, with a brief explanation and some personal review comments. One nice feature is that all these commands can be abbreviated to two letters, as per Pets Basic commands.

AUTO

This command automatically prints the line numbers for you when keying in a program. The start line (defaults to 100 if not specified) and increment (defaults to 10) can be specified. After a line of BASIC is keyed in the next line number appears automatically.

Will save time, but not a lot.

DELETE

A real time saver - DELETE 300 - 500 will remove lines 300 - 500 inclusive. The command string can be shortened to DELETE 200 - etc. as in LIST. DELETE is especially useful at the early stages in a program when different routines are being tried.

FIND

Absolutely invaluable if you wish to change or alter a program's construction. FIND will search out and print all lines containing a specified string of characters and/or words. For example, FIND GOSUB 1000 will print all the lines which contain GOSUB 1000, and FIND A1 will list all lines in which the variable A1 is used.

RENUMBER

This will renumber your program, starting from a specified line number (defaults to 100) in equal specified increments (defaults to 10). All GOTO's and GOSUB's are changed accordingly. Although a renumber facility is useful for 'opening out' a crowded program, it is not possible to renumber a small part of a program. This means that if you start your subroutines at multiples of 1000 (1000, 2000, etc.) for an easily identifyable program structure, RENUMBER will lose this - very annoying.

APPEND

Adds a previously saved program onto the end of a program in memory. Although APPEND will not interleave line numbers as will the Butterworth method, this is not a great disadvantage since APPEND is mostly used for building up programs from a library of subroutines. It does have the advantage over the Butterworth method in that is appends normal saved programs and not pseudo data files.

DUMP

Prints out the names and values of all (non-dimensioned) variables used in a program, when it has stopped. Variables are displayed in their order of creation and can be changed with screen editing. A useful feature for finding out why a program is not working as expected.

HELP

When a program halts due to an error, HELP displays the appropriate line, with the offending character highlighted in reverse field. A useful teaching aid for beginners in Syntax Errors and a time saver for advanced programmers, especially when using multiple statements per line.

TRACE, STEP, OFF

These commands are used while a program is running and display the line numbers as they are executed in a reverse field window on the screen, together with the previous five line no.'s. The speed of operation can be controlled with the SHIFT and STOP keys and STEP allows Basic to be executed one line at a time. OFF turns TRACE and STEP off. These commands are somewhat disappointing in that they don't display the contents of the line as well as the line no.'s (unlike one tape-based version from the States) but do at least display several line numbers at once.

Programmers Toolkit is a Commodore Endorsed product and will be available from Petsoft in October. The chip for 16/32K Pets costs £55 + VAT and the version for 8K Pets - £75 + VAT.

DIGITAL TO ANALOGUE CONVERSION

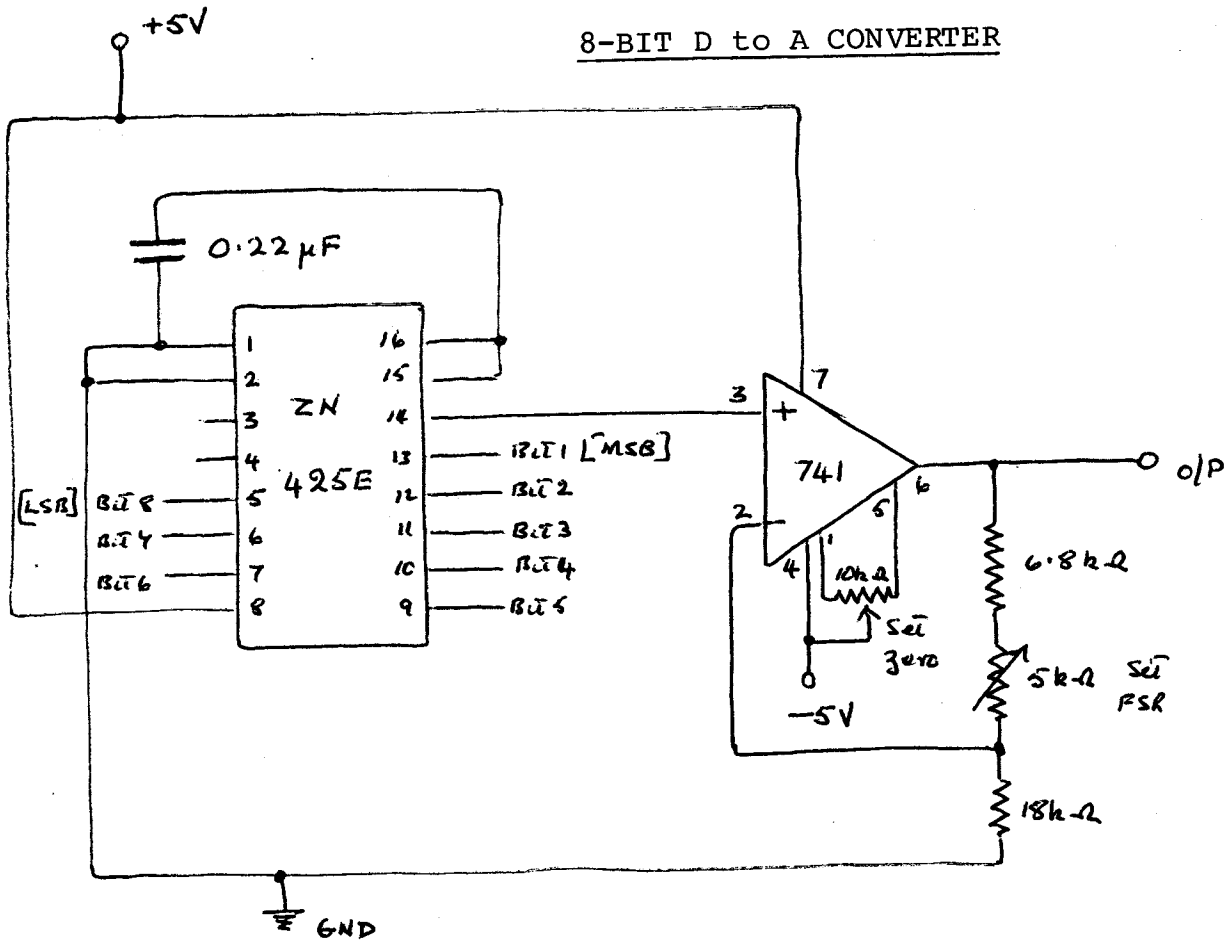
D. Muir of Napier College, Mercheston, Edinburgh, who sent in a design for the 'Blinkin' Lights' machine, published last issue, has sent us another circuit - this time for an analogue output from the Pet.

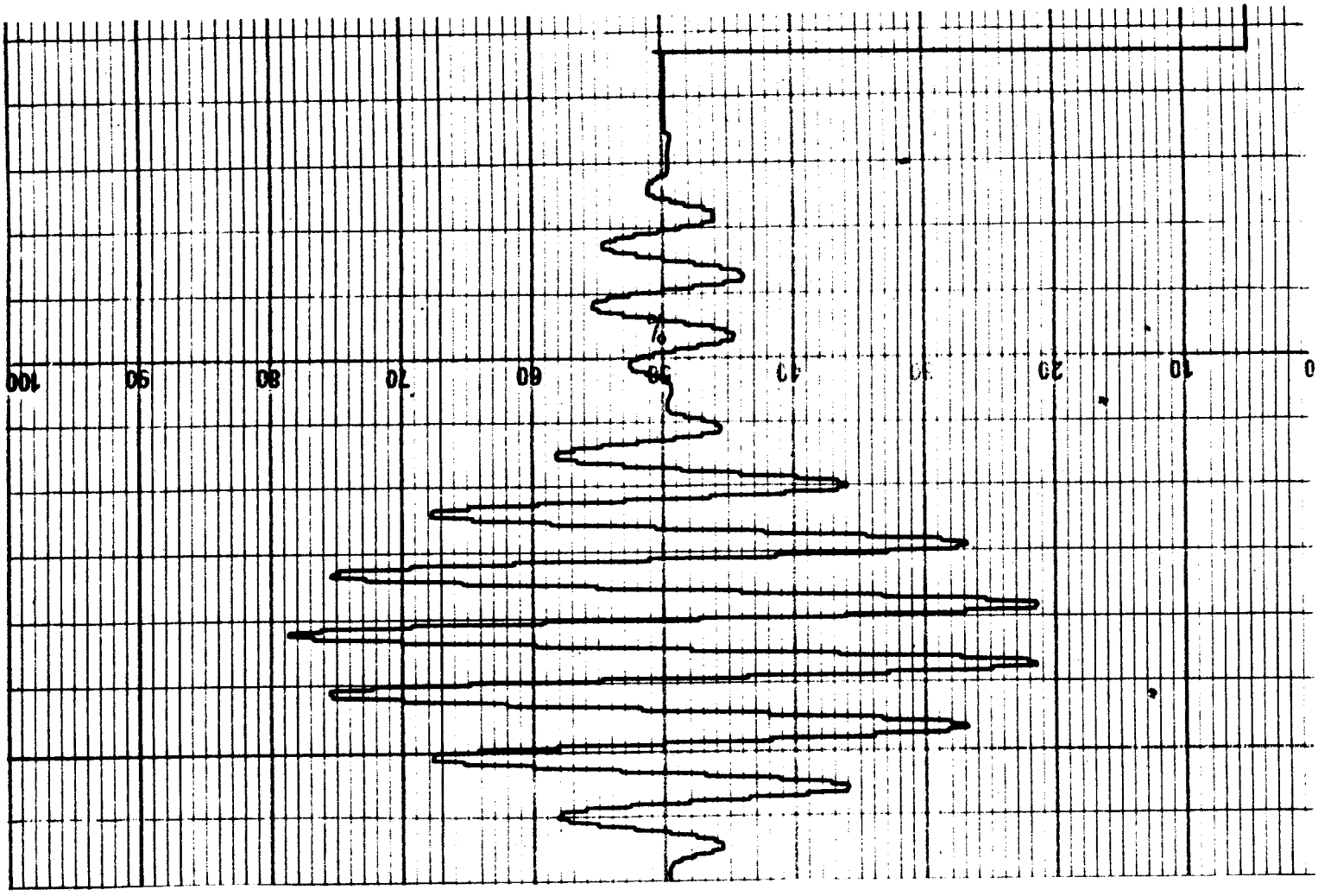
Designed to attach to the User Port or to the 'Blinkin' Lights' machine directly, the circuit is especially suitable for driving a "servoscribe" pen-recorder as mentioned by Dr. Smyth in issue No. 4. A sample print-out from this machine, along with the program to produce that waveform, is shown.

It should be noted that bit 1 on the D to A convertor must be connected to the Most Significant Bit on the User Port.

```
2ØØ  POKE59471,128
25Ø  FORJ=1TO5ØØØ:NEXTJ
3ØØ  K1=2*π/8:K2=K1/8
4ØØ  A=A/5ØØØ
5ØØ  DIMA(256),A%(256)
7ØØ  FORI=ØTO255:X=(I-128.ØØ1)/1.28
8ØØ  A(I)=1Ø*CO S (K1*X)*SIN(K2*X)/X
9ØØ  A%(I)=128*A(I)
1ØØØ PRINTI,X,A%(I)
1Ø5Ø A%(I)=A%(I)+127
11ØØ POKE59471,A%(I)
115Ø FORJ=1TO5Ø:NEXTJ
2ØØØ NEXTI
25ØØ FORJ=1TO5ØØØ:NEXTJ
3ØØØ POKE59471,Ø
```

8-BIT D to A CONVERTER





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Beginning Machine Code — An Introduction

The most common request in our PUC survey, two issues ago, was for a series of articles explaining Machine Code from the absolute basics. In this issue, we shall be dealing with definitions by way of answering some commonly asked questions. For those of you who want to proceed faster than this, we recommend books such as Rodney Zaks "Programming the 6502".

* * * * * * * * *

WHAT IS MACHINE CODE? (abrev. M/C code)

Machine code is the language understood by the Microprocessor at the heart of any micro-computer system. Each type of microprocessor requires its own special machine code, although most have several features and principles in common. This series will teach 6500 Machine Code since the Pet is based on a 6502 Microprocessor.

Any software to be run on a microprocessor must first be translated into machine code. Most personal computer software is written in a 'high-level' language such as BASIC (the higher the level of a language, the more it reads like English - machine code is termed a 'low-level' language since it consists of numbers or binary digits only).

There are two methods of translating a high-level language into M/C code. A compiler translates the whole program in one go, so that the program can then be run straight on the microprocessor, very efficiently. This, however, requires a lot of RAM space and so compilers are rare on micro-computers. The alternative is to use an Interpreter (as on the Pet) where the language is translated line by line and M/C subroutines in ROM are called as and when required by the Interpreter. As might be expected, the latter means that the program runs many times slower (particularly in loops), but needs less space, and is particularly suitable for interactive systems such as the one on your Pet.

WHAT ARE THE ADVANTAGES OF WRITING DIRECTLY IN MACHINE CODE?

If you can write a program (or part of a program) directly in M/C code then it will execute up to a hundred times faster. The disadvantage is that M/C code is rather more difficult to write than BASIC. It is thus common practice to write most of a large program in BASIC and 'drop down' into M/C code where a routine can easily be written thus.

WHAT TYPE OF ROUTINES ARE SUITABLE FOR WRITING IN MACHINE CODE?

Any routine which is largely made up from PEEK and POKE statements is an ideal candidate for M/C code writing. These include software interfaces to drive peripherals and routines for shifting blocks of memory.

Also suitable are routines which involve a simple operation being repeated a large number of times, such as string processing.

In contrast, routines which involve complex mathematical calculations are difficult to write in M/C code, unless you have access to a well written library of M/C code arithmetic subroutines.

HOW DO I RUN A MACHINE CODE ROUTINE ON THE PET?

There are two methods of accessing a M/C code routine from BASIC. SYS (location) will transfer the operation of PET from BASIC to the M/C code starting at the specified location. USR (parameter) will transfer to M/C code at a pre-determined location. In addition, it is possible to pass a parameter between BASIC and M/C code - either a BASIC variable or a constant. The operation of these two commands is detailed in the Pet manual.

WHAT DOES MACHINE CODE LOOK LIKE?

True M/C code, as stored in the memory, consists of binary digits. For compactness in print, ease of entry and to help avoid errors, the M/C code is often written in base 16 known as Hexadecimal or Hex. A piece of M/C code might be written thus:-

```
AD Ø3 IF
18
69 Ø4
8D Ø3 IF
ØØ
```

This kind of program is very difficult to read so the various instructions are given mnemonic codes. For example, the instruction 8D puts the contents of the accumulator into a particular byte of memory. This is given the mnemonic "STA" (store accumulator). The above program in this form might be written:-

MNEMONICS	EXPLANATION
LDA VALUE	Load "value" into accumulator
CLC	Clear contents of carry flag
ADC #Ø4	Add with carry 4 to accumulator
STA VALUE	Store accumulator in "value"
BRK	Break (halt)

This is called an Assembly Language program. Generally speaking, a routine is developed in Assembly Language. It is then converted to pure M/C code by means of an "Assembler". This is not as complicated as interpreting a high-level language because each mnemonic can be converted by a look-up table. This sort of conversion is known as "one to one".

A Disassembler converts M/C code into mnemonic form to help de-bug or alter an existing routine.

WHAT DO THE STATEMENTS IN A MACHINE CODE ROUTINE ACTUALLY DO?

The microprocessor contains certain 8-bit registers such as the Accumulator, X register and status register. It understands 56 types of instruction (e.g. ADC) although most of these have several variations or addressing modes. Most of these instructions perform a simple operation on one or more of these registers. For example, CLC sets one of the bits in the status register to zero. On a microprocessor the most advanced type of instruction is the addition or subtraction of two bytes. All other functions must be built up from this level.

Programming

We received a letter from Jim Butterfield, in Toronto, detailing the finalised version of the merge routine which we printed in a previous issue. The text follows:-

Merging PET programs: a final report — Jim Butterfield, Toronto

To wrap up the various activities surrounding merging or UNLIST, and bring them up to date with information on new ROM:

I. To change a program into a data file on cassette tape:

Mount blank tape on cassette 1. Type:

```
OPEN 1,1,1 : CMD 1 : LIST
```

Cassette tape will write. When writing is complete, the flashing cursor will return, but PET will not print READY - the word READY is in fact written on tape. Now close the CMD and tape file with:

```
PRINT#1 : CLOSE 1
```

This "merge" tape may now be saved for any future occasion.

Variations:
- - the file may be named, e.g. OPEN 1,1,1, "TEST MERGE": ... etc. It's good practice to name files if you plan to keep them.
- - if desired you may copy only part of the program to tape, e.g. ... CMD 1 : LIST 500-700 ... This is a handy way to extract subroutines from a larger program.

II. To merge a data file (in the above format) into program space:

The procedure is slightly different on original ROM as compared to the new ROM, which I'll call upgrade ROM.

The program with which you wish to merge must first be loaded into memory. The following procedure may be repeated many times, so that you may merge several program blocks together.

Mount "merge" tape on cassette 1. Type:

Original ROM: POKE 3,1 : OPEN 1
Upgrade ROM: POKE 14,1: OPEN 1

Tape will now be read. Eventually, the computer will report FOUND and the cursor will return.

Now: clear the screen and press exactly three cursor downs. Type:

Original ROM: POKE 611,1 : POKE 525,1 : POKE 527,13 : ?"h"
Upgrade ROM: POKE 175,1 : POKE 158,1 : POKE 623,13 : ?"h"

("h" is the cursor home key - it will print as a reverse S).

As soon as you press RETURN at the end of this line, the word READY will appear above the line, and tape will move. When the merge is complete, the computer will print either ?OUT OF DATA ERROR or ?SYNTAX ERROR below the line. This is normal and does not signify a real error. The job is now complete.

Note the four new items:

- - a new POKE statement before OPEN 1;
- - three cursor downs before the final POKE;
- - only one final POKE line to be typed;
- - no need to close the file at end of merge.

The new system is simpler, and also corrects a minor problem on the original POKE 611 merge. Few people spotted it, but the original procedure caused line 1 to disappear.

* * * * * * * * * *

The following routines were developed by Paul Higginbottom for use in the Commodore Pet Centre.

The first, which is for 8K Pets but can be adapted for new Roms, allows repeated cursor movements. The cursor in this routine is shown as an asterisk and will move in the desired direction as long as the key is pressed down:

```
10 PRINT "ch ⇓ ⇓ ⇓ ⇒⇒⇒ *⇐ ;
20 A = (PEEK (515))OR (PEEK (516) * 128)
30 IF A = 255 OR (A<>66 AND A<>73 AND A<>194 AND A<>201)
   THEN 20
40 IF A = 66 THEN PRINT "   ⇓⇐*⇐ "; : GOTO 20
50 IF A = 73 THEN PRINT " *⇐ "; : GOTO 20
60 IF A = 194 THEN PRINT "  ⇑⇐*⇐ "; : GOTO 20
70 IF A = 201 THEN PRINT "  ⇐⇐*⇐ "; : GOTO 20
```

The second will produce a "perfect resolution" sine wave down the paper on a Commodore 3022 tractor feed printer:

```
1Ø  DIMA$ (5)
2Ø  FORI = ØTO5
3Ø  FORJ = ØTO5
4Ø  READA:A$ (I) = A$ (I) + CHR$ (A)
5Ø  NEXTJ,I
6Ø  DATA64,Ø,Ø,Ø,Ø,Ø
65  DATAØ,64,Ø,Ø,Ø,Ø
7Ø  DATAØ,Ø,64,Ø,Ø,Ø
75  DATAØ,Ø,Ø,64,Ø,Ø
8Ø  DATAØ,Ø,Ø,Ø,64,Ø
85  DATAØ,Ø,Ø,Ø,Ø,64
1ØØ FORI=ØTO2*πSTEPπ /1ØØ
1Ø5 B=(SIN(I)+1)*23Ø
11Ø OPEN6,4,6:PRINT#6,CHR$(5)
12Ø OPEN5,4,5:PRINT#5,A$((B/6-INT(B/6))*6)
13Ø OPEN4,4,Ø:PRINT#4,TAB(INT(B/6));CHR$(254)
14Ø CLOSE4:CLOSE5:CLOSE6:NEXTI
```

* * * * * * * * * * *

The letter below, originally came to us as a printout, presumably from Mr. Herbert's test processor. Regrettably, the text would not re-print and had to be re-typed. The routine is not as daft as it may seem!

Dept. of Animal Services
Ninewells Hospital
Dundee DD2

31st August 1979

Dear Sir,

You may like to have the enclosed short program for the 'Newsletter'. It eliminates itself!

This is not just a joke but can be used e.g. to eliminate instructions before using a text processor so as to free working space for strings. In that case line 7 would be a 'GETA$' loop. Two or more, programs i.e. lines 8 & 9 can be placed in sequence so as to eliminate more lines.

My printer doesn't do graphics so the control characters have been represented as follows:

Clear screen = cls
Cursor down = d
Cursor up = ^
These are underlined in ink in the print-out submitted.

The program works as follows:

Line 8 prints the figures 1 to 9 down the screen and puts 9 'returns' into the keyboard buffer (poked into locations 527, 528 etc.)

Line 9 puts an additional 'return' into the buffer (536 by now) so that the instruction 'RUN100' is covered. This gets the program going again after 'END'. Three more 'Cursor ups' are printed than the number of lines to be deleted. Nine lines in this case, so 12 'Cursor ups'. Then the number of items in the buffer are put into location 525, and they are fired off by 'END'.

Yours sincerely,

W. J. Herbert

```
1   REM
2   REM
3   REM
4   REM
5   REM
6   REM
7   REM
8   PRINT"clsdd":FORI=1TO9:PRINT:POKE526+I,13:NEXT
9   POKE536,13:PRINT"RUN100^^^^^^^^^^":POKE525,10:END
100 PRINT"clsELIMINATED!"
```

* * * * * * * * * *

To simplify the use of our 2040 disk, we are making available a program called: "WEDGE - DOS SUPPORT PROGRAM". This adds several commands to the Pet in direct mode and simplifies several disk procedures. Dealers already have copies and it is being included with future deliveries of floppy disk units.

DOS SUPPORT PROGRAM

The purpose of this program is to aid the CBM or PET 2001 User in operating the 2040 Dual Floppy Disk System. This instruction sheet has been written with the assumption that the reader has a working knowledge of the 2001 series and the 2040.

NOTE: This program has been placed in the public domain. Please refer all comments and suggestions to the Editor.

The normal method with which the PET communicates with an IEEE Buss device is by the BASIC commands OPEN, PRINT, GET, INPUT and CLOSE. These statements are somewhat verbose in nature and therefore more prone to operator error. There is also the limitation that INPUT and GET cannot be used in direct mode due to shared buffer areas. These conditions are easily handled with the DOS SUPPORT PROGRAM.

DOS SUPPORT PROGRAM may be loaded (saved) as if it were a normal BASIC program. Note should be made of the fact that the 2040 has a special load file name '*' which if used immediatly after power up (reset) executes the following:

1. Initalizes Drive 0
2. Loads the first file on that drive

Thus if the command LOAD"*",8 is executed and the DOS SUPPORT Program is the first directory entry it will be loaded. When the DOS SUPPORT Program is executed it relocates itself up into the highest available RAM memory locations, links into the CHRGET routine and adjusts BASIC's top of memory pointer down. This technique uses about 350 bytes of the Users memory but normal machine operations may proceed without having to reload the DOS SUPPORT Program until such time that a system reset is performed.

The DOS SUPPORT Program functions by capturing the data that the PET operating system passes to BASIC, before the interpreter has a chance to spare it. Thus we can look for Key (escape) characters and process the disk command which follows without the use or knowledge of the BASIC interpreter.

There are four key characters that are recognized by the DOS SUPPORT Program. They will be processed only when they are found in column one of an input line, otherwise a SYNTAX ERROR will occur.

DOS SUPPORT KEY CHARACTERS

@ or > - Passes commands to the Disk.
/ - LOAD's a program.
↑ - LOAD's and RUN's a program.

The greater than symbol when used preceeding a 2040 Disk command, passes that command directly to the Floppy Disk System. See the following examples.

```
Thus:
>IØ
is the same as:
PRINT#15,"IØ"
and:
>SØ:FILE1
is equal to:
PRINT#15,"SØ:FILE1"
```

As you can see the > symbol is a substitute for the PRINT#15 statement. Remember that an OPEN statement is required before a PRINT may be executed but no OPEN is required for the DOS SUPPORT Program.

The second function of the > command is the directory list command. As you know the directory of a minidisk can be loaded with a LOAD"$Ø",8. This LOAD will destroy any program you might have in memory. To avoid the destruction of the current program the DOS SUPPORT program prints the directory on the screen.

To avoid possible directory schrolling, you may depress the SPACE key to stop the listing of a directory. Depress any key to continue the listing - or you may depress the RUN/ STOP key to stop the directory listing and return to BASIC.

```
>$Ø
```

Means - Display the entire directory of Drive Ø

```
>$1:Q*
```

Means - Display the directory entries of all files on Drive 1 that have names starting with the letter Q.

The third function of the > command is the error channel interrogation feature. The error channel is read by typing a > followed immediately by a RETURN. This is equivilent to the following program segment.

```
10 OPEN 15,8,15
20 INPUT#15,ER,MSG$,DRV,SEC
30?ER",MSG$","DRV","SEC
```

For Users that have the CBM Model Business Keyboard the "@" key may be used in place of the > for key entry convience. This eliminates shifting for this command.

The LOAD / and LOAD-RUN ↑ command characters operate the same as their BASIC counterparts only with a simplified syntax as follows: /WUMPUS

- This command will load the program file WUMPUS. Both drives will be searched if required.

↑1:COPY DISK FILES

- This command will load the program COPY DISK FILES from Drivel 1 (if it is there) and execute it.

The following requirements and limitations are placed on the DOS SUPPORT Program User.

1. The DOS SUPPORT commands may only be used in the direct mode.
2. Programs using GET or INPUT should disable the DOS SUPPORT program with the following command:

POKE 1022,128

Then, prior to program exit, DOS SUPPORT can be restored by using another POKE statement:

POKE 1022,08

3. The DOS SUPPORT Program can be disabled/restored on the direct mode as shown above, or may be disabled easily by typing:

>K and depressing RETURN

```
5 SYS2222
10 PRINT"□"TAB(11)"_____"
20 PRINTTAB(11)"■ PET DOS SUPPORT "
30 PRINTTAB(14)"NOW  LOADED
40 PRINTTAB(9)"  COMMANDS FOLLOWING"
50 PRINTTAB(7)"A > OR @  IN COLUMN 1 WILL"
60 PRINTTAB(9)"BE PASSED TO THE DISK.■"
90 PRINTTAB(7)"CMD        DESCRIPTION"
140 PRINTTAB(7)"$      DIRECTORY BOTH DRIVES
150 PRINTTAB(7)"$0     DIRECTORY DRIVE 0
160 PRINTTAB(7)"$1     DIRECTORY DRIVE 1■"
180 PRINTTAB(7)"  ALL 2040 COMMANDS MAY BE
190 PRINTTAB(7)"ENTERED AS IF THEY WERE IN
200 PRINTTAB(7)"A PRINT# STATEMENT.
220 PRINTTAB(11)"■■SPECIAL COMMANDS
230 PRINTTAB(7)"■/      LOAD A PROGRAM
240 PRINTTAB(7)"↑      RUN  A PROGRAM
250 PRINT"  SPECIAL COMMANDS START IN COL 1 AND
260 PRINT"ARE FOLLOWED BY A 2040 FILENAME.
270 NEW
```

PETDOS4.0.

```
LINE# LOC    CODE          LINE

0001  0000                ;**********************************
0002  0000                ;*
0003  0000                ;*  PET DOS SUPPORT
0004  0000                ;*
0005  0000                ;*    04-27-79
0006  0000                ;*
0007  0000                ;*  BOB FAIRBAIRN
0008  0000                ;*
0009  0000                ;**********************************
0010  0000                ;*
0011  0000                ;* VERSION 3.1 6/14/79
0012  0000                ;*    ADD @ PROMPT FOR BUSINESS
0013  0000                ;*    KEYBOARD. ADD STOP KEY CHECK
0014  0000                ;*    IN DIRECTORY PRINT. ADD
0015  0000                ;*    HALT IN DIRECTORY PRINT
0016  0000                ;*
0017  0000                ;* VERSION 3.2 7/2/79
0018  0000                ;*    FOR (-04) ROM
0019  0000                ;*    WITH LOAD ADDRESS ONE OFF
0020  0000                ;*    BYTE LOW.
0021  0000                ;*
0022  0000                ;* VERSION 3.3 7/2/79
0023  0000                ;*    ADD STACK LOOKUP FOR
0024  0000                ;*    ACTIVATION.
0025  0000                ;*
0026  0000                ;* VERSION 4.0 7/5/79
0027  0000                ;*    ADD CONTROL FOR CMD DURING
0028  0000                ;*    A DIRECTORY LISTING.
0029  0000                ;*


0031  0000                ;
0032  0000                ;BASIC VARIABLES USED
0033  0000                ;
0034  0000                VERCK   =$9D            ;VERIFY FLAG
0035  0000                SAL     =$C7            ;INDIRECT POINTER LO
0036  0000                SAH     =$C8            ;HI
0037  0000                WSW     =$B3            ;UNUSED FLAG (BASIC)
0038  0000                CNTDN   =$BA            ;SAVE AREA
0039  0000                GRBTOP  =$5C            ;INDIRECT POINTER
0040  0000                MEMSIZ  =$34            ;POINTER TO TOP MEM
0041  0000                TXTPTR  =$77            ;POINTER TO BUF
0042  0000                SPERR   =$10            ;EOI ERROR BIT
0043  0000                BUF     =$0200          ;BASIC INPUT BUFFER
0044  0000                STATUS  =$96            ;STATUS BYTE
0045  0000                SA      =$D3            ;SECONDARY ADDRESS
0046  0000                FA      =$D4            ;PRIMARY ADDRESS
0047  0000                LA      =$D2            ;LOGICAL DEVICE #
0048  0000                FNLEN   =$D1            ;FILE NAME LENGTH
0049  0000                FNADR   =$DA            ;FILE NAME ADDRESS
0050  0000                EAL     =$C9            ;END ADDR LO
0051  0000                EAH     =$CA            ;HI
```

```
0052  0000                DFLIO   =$B0            ;DEFAULT OUTPUT DEV.
0053  0000                VARTAB  =$2A            ;END OF BASIC PGM.
0054  0000                TMP2    =$FD            ;TEMP VARIABLE
0055  0000                ;
0056  0000                ;PROGRAM VARIABLES
0057  0000                ;
0058  0000                CR      =$0D            ;SYMBOLIC CARRIAGE RETURN
0059  0000                FLAG    =WSW            ;BYTE USED AS A FLAG
0060  0000                PIAK    =$E812          ;KEYBOARD I/O PORT
3061  0000                CMDLN   =CMDEND-CMD     ;LENGTH OF RELCOATE

0063  0000                ;
0064  0000                ;PET ROUTINES USED
0065  0000                ;
0066  0000                LINPRT  =$DCD9          ;PRINT LINE #
0067  0000                SPMSG   =$F315          ;SEND A MESSAGE
0068  0000                LD15    =$F322          ;LOAD ROUTINE
0069  0000                TWAIT   =$F8E6          ;WAIT FOR STOP KEY
0070  0000                CHRGET  =$70            ;INPUTS CHARACTERS
0071  0000                CHRGOT  =$76            ;GET LAST CHAR
0072  0000                NEWSTT  =$C6C4          ;NEW STATEMENT EXEC
0073  0000                PRT     =$E3D8          ;PRINT A CHARACTER
0074  0000                LISTN   =$F0BA          ;SEND LISTEN
0075  0000                SECND   =$F128          ;SEND SA
0076  0000                CIOUT   =$F16F          ;SEND CHARACTER
0077  0000                UNLSN   =$F183          ;UN LISTEN
0078  0000                ACPTR   =$F18C          ;GET A CHARCATER
0079  0000                TALK    =$F0B6          ;SEND TALK
0080  0000                OPENI   =$F466          ;OPEN FILE
0081  0000                FCLOSE  =$F2AE          ;CLOSE FILE
0082  0000                READY   =$C389          ;REENTER BASIC
0083  0000                RUNC    =$C572          ;CLEAR VARIABLES
0084  0000                LNKPRG  =$C442          ;LINK BASIC LINES
0085  0000                UNTLK   =$F17F          ;UN TALK
0086  0000                STXTPT  =$C5A7          ;SET START TEXT POINTER
0087  0000                CHKIN   =$F770          ;CHECK IN
0088  0000                CHKOUT  =$F7BC          ;CHECK OUT
0089  0000                CLRCHN  =$FFCC          ;CLEAR CHANNEL
0090  0000                BASIN   =$FFCF          ;BASIC IN
0091  0000                STOP1   =$F301          ;CHECK FOR STOP KEY
0092  0000                BSOUT   =$FFD2          ;BASIC OUT
0093  0000                FOPEN   =$F524          ;FILE OPEN
0094  0000                LD209   =$F3E6          ;LOAD ERROR

0096  0000                ;
0097  0000                ;WEDGE IN ROUTINE WITH THE
0098  0000                ;COMMAND PARSER AND EXECUTITION
0099  0000                ;
0100  0000                        *=$0700
0101  0700                ;
0102  0700  EA            CMD     NOP             ;THROWN AWAY
0103  0701  E6 77                   INC TXTPTR      ;BUMP POINTER
0104  0703  D0 02                   BNE WG100
0105  0705  E6 78                   INC TXTPTR+1
0106  0707  86 B3          WG100   STX WSW         ;SAVE X IN WSW
```

```
0107  0709  BA                TSX             ;GET STACK POINTER
0108  070A  BD 01 01          LDA $0101,X
0109  070D  C9 9B            CMP #$9B        ;WERE WE CALLED BY MAIN
0110  070F  D0 3A            BNE NOMAIN      ;NO...
0111  0711  BD 02 01          LDA $0102,X     ;MAYBE?
0112  0714  C9 C3            CMP #$C3
0113  0716  D0 33            BNE NOMAIN      ;NOT THERE...
0114  0718  A5 77            LDA TXTPTR      ;FIRST COLUMN
0115  071A  D0 2C            BNE WG997       ;GET OUT NOT FIRST CHR
0116  071C  A5 78            LDA TXTPTR+1
0117  071E  C9 02            CMP #>BUF       ;IN BUFFER?
0118  0720  D0 26            BNE WG997
0119  0722                  ;
0120  0722  A0 00          WG110 LDY #0          ;.Y IS BUF INDEX
0121  0724  84 B3            STY FLAG        ;FLAG SET FOR DIR
0122  0726  B1 77            LDA (TXTPTR),Y
0123  0728  C9 3E            CMP #'>         ;COMMAND PROMPT?
0124  072A  F0 11            BEQ WG115       ;YES...
0125  072C  C9 40            CMP #'@         ;BUSINESS KEYBOARD PROMPT
0126  072E  F0 0D            BEQ WG115       ;YES...
0127  0730  C8              INY
0128  0731  85 B3            STA FLAG        ;SET FLAG FOR LOAD
0129  0733  C9 2F            CMP #'/         ;LOAD PROMPT
0130  0735  F0 63            BEQ DODIR
0131  0737  C9 5E            CMP #94         ;CHECK FOR ARROW
0132  0739  F0 5F            BEQ DODIR
0133  073B  D0 0B            BNE WG997
0134  073D  C8              WG115 INY
0135  073E  B1 77            LDA (TXTPTR),Y
0136  0740  F0 32            BEQ RDERR       ;READ ERROR CHANNEL
0137  0742  C9 24            CMP #'$         ;DIRECTORY?
0138  0744  F0 54            BEQ DODIR       ;YES
0139  0746  D0 08            BNE NOTDIR
0140  0748  4C 76 00       WG997 JMP CHRGOT
0141  074B  A6 B3          NOMAIN LDX WSW        ;RESTORE .X AND
0142  074D  4C 76 00            JMP CHRGOT      ;RETURN TO CHRGOT

0144  0750                  ;
0145  0750                  ; SEND COMMAND TO DISK
0146  0750                  ;
0147  0750  A9 08          NOTDIR LDA #8         ;GET DEVICE ADDRESS
0148  0752  85 D4              STA FA
0149  0754  A9 6F              LDA #$6F        ;SECONDARY ADDRESS 15
0150  0756  85 D3              STA SA
0151  0758  20 BA F0           JSR LISTN
0152  075B  A5 D3              LDA SA
0153  075D  20 28 F1           JSR SECND       ;SEND SECONDARY ADDR
0154  0760  E6 77          BUMP  INC TXTPTR
0155  0762  A0 00              LDY #0          ;INDEX=0
0156  0764  B1 77              LDA (TXTPTR),Y  ;GET THE FIRST CHARACTER
0157  0766  F0 06              BEQ WG120       ;ZERO IS LAST CHAR
0158  0768  20 6F F1           JSR CIOUT       ;SEND THE CHAR
0159  076B  B8                CLV
0160  076C  50 F2              BVC BUMP        ;MORE
0161  076E                  ;
0162  076E  20 63 F1       WG120 JSR UNLSN       ;UN LISTEN
```

```
0163  0771  B8                    CLV
0164  0772  50 23                 BVC WG998
0165  0774                        ;
0166  0774                        ; READ THE ERROR CHANNEL
0167  0774                        ;
0168  0774  84 77        RDERR    STY TXTPTR        ;FIX POINTER
0169  0776  A9 08                 LDA #8            ;SET FA
0170  0778  85 D4                 STA FA
0171  077A  20 B6 F0              JSR TALK
0172  077D  A9 6F                 LDA #$6F          ;COMMAND CHANNEL SA
0173  077F  85 D3                 STA SA
0174  0781  20 28 F1              JSR SECND         ;SEND SA
0175  0784  20 8C F1     WG140    JSR ACPTR         ;GET BYTE FROM DISK
0176  0787  C9 0D                 CMP #CR
0177  0789  F0 06                 BEQ WG130
0178  078B  20 D8 E3              JSR PRT           ;PRINT BYTE TO SCREEN
0179  078E  B8                    CLV
0180  078F  50 F3                 BVC WG140         ;LOOP FOR MORE
0181  0791  20 D8 E3     WG130    JSR PRT           ;PRINT CR
0182  0794  20 7F F1              JSR UNTLK         ;UN TALK
0183  0797  4C 76 00     WG998    JMP CHRGOT        ;DONE WITH CMD
0185  079A                        ;
0186  079A                        ;PRINT THE DIRECTORY
0187  079A                        ;
0188  079A  C8           DODIR    INY               ;GET LENGTH OF CMD
0189  079B  B1 77                 LDA (TXTPTR),Y
0190  079D  D0 FB                 BNE DODIR
0191  079F  88                    DEY
0192  07A0  84 D1                 STY FNLEN         ;SET LENGTH (-1)
0193  07A2  A9 01                 LDA #<BUF+1       ;FILE NAME ADDRESS
0194  07A4  85 DA                 STA FNADR
0195  07A6  A9 02                 LDA #>BUF
0196  07A8  85 DB                 STA FNADR+1
0197  07AA  A9 08                 LDA #8            ;DEVICE ADDRESS
0198  07AC  85 D4                 STA FA
0199  07AE  A5 B3                 LDA FLAG          ; 0 MEANS DIR
0200  07B0  D0 53                 BNE LOADB         ;DO A LOAD
0201  07B2  A5 D2                 LDA LA            ;SAVE LA
0202  07B4  85 B3                 STA WSW
0203  07B6  A5 B0                 LDA DFLTO         ;SAVE DFLTO
0204  07B8  85 BA                 STA CNTDN
0205  07BA  A9 60                 LDA #$60          ;SECONDARY ADDR
0206  07BC  85 D3                 STA SA
0207  07BE  A9 0E                 LDA #14           ;OPEN THE FILE
0208  07C0  85 D2                 STA LA
0209  07C2  20 83 F1              JSR UNLSN         ;DON'T LISTEN TO FLOPPY
0210  07C5  20 24 F5              JSR FOPEN
0211  07C8  A9 00                 LDA #0
0212  07CA  85 96                 STA SATUS         ;SET STATUS TO 0
0213  07CC  A0 03                 LDY #$03          ;LOOP THREE TIMES
0215  07CE  84 D1        WG220    STY FNLEN         ;SAVE NEW COUNT
0216  07D0  A2 0E                 LDX #14           ;DISK CHANNEL
0217  07D2  20 70 F7              JSR CHKIN
0218  07D5  20 CF FF              JSR BASIN
0219  07D8  85 FD                 STA TMP2
0220  07DA  A4 96                 LDY SATUS         ;CHECK STATUS
0221  07DC  D0 29                 BNE WG235B        ;BAD STATUS
0222  07DE  20 CF FF              JSR BASIN
0223  07E1  85 FE                 STA TMP2+1
0224  07E3  A4 96                 LDY SATUS         ;CHECK STATUS
0225  07E5  D0 20                 BNE WG235B
0226  07E7  A4 D1                 LDY FNLEN         ;MORE TO DO?
0227  07E9  88                    DEY
0228  07EA  D0 E2                 BNE WG220         ;NOT DONE YET
0229  07EC  20 CC FF              JSR CLRCHN        ;CLEAR CHANNEL
```

```
0230  07EF  A6 BA          LDX CNTDN       ;CHECK DFLTO FOR SCREEN
0231  07F1  E0 03          CPX #3
0232  07F3  F0 05          BEQ *+7
0233  07F5  A6 B3          LDX WSW         ;OPEN THE PRINT CHANNEL
0234  07F7  20 BC F7       JSR CHKOUT
0235  07FA  A6 FD          LDX TMP2
0236  07FC  A5 FE          LDA TMP2+1
0237  07FE  20 D9 DC       JSR LINPRT      ;PRINT LINE NUMBER
0238  0801  A9 20          LDA #'          ;PRINT A SPACE
0239  0803  D0 06          BNE SKIPB       ;SKIP OVER BRANCHES
0240  0805  D0 6C    LOADB BNE LOAD        ;(JMP)
0241  0807  D0 5D    WG235B BNE WG230      ;(JMP)
0242  0809  D0 C3    WG220B BNE WG220      ;(JMP)
0243  080B  20 D2 FF SKIPB JSR BSOUT
0244  080E  20 CC FF       JSR CLRCHN
0245  0811  A2 0E    WG250 LDX #14         ;DISK CHANNEL
0246  0813  20 70 F7       JSR CHKIN
0247  0816  20 CF FF       JSR BASIN
0248  0819  48             PHA
0249  081A  20 CC FF       JSR CLRCHN
0250  081D  68             PLA
0251  081E  A6 96          LDX SATUS
0252  0820  D0 44          BNE WG230       ;BAD
0253  0822  C9 00          CMP #0          ;EOL
0254  0824  F0 26          BEQ WG240
0255  0826  A6 BA          LDX CNTDN       ;CHECK DFLTO FOR SCREEN
0256  0828  E0 03          CPX #3
0257  082A  F0 05          BEQ *+7
0258  082C  A6 B3          LDX WSW
0259  082E  20 BC F7       JSR CHKOUT
0260  0831  20 D2 FF       JSR BSOUT
0261  0834  20 CC FF       JSR CLRCHN
0262  0837                ;
0263  0837                ;CHECK FOR STOP KEY AND PAUSE
3264  0837                ;
0265  0837  20 01 F3       JSR STOP1       ;STOP KEY
0266  083A  F0 2A          BEQ WG230       ;YES...
0267  083C  20 E4 FF       JSR $FFE4       ;GET A CHAR FROM KEYBOARD
0268  083F  F0 D0          BEQ WG250       ;NOTHING...
0269  0841  C9 20          CMP #$20        ;SPACE BAR?
0270  0843  D0 CC            BNE WG250       ;NO...
0271  0845  20 E4 FF  WG255  JSR $FFE4       ;ANY KEY STARTS
0272  0848  F0 FB            BEQ WG255
0273  084A  D0 C5            BNE WG250       ;(JMP)
0274  084C                  ;
0275  084C  A9 0D            WG240  LDA #CR
0276  084E  A6 BA                   LDX CNTDN       ;CHECK DFLTO FOR SCREEN
0277  0850  E0 03                   CPX #3
0278  0852  F0 05                   BEQ *+7
0279  0854  A6 B3                   LDX WSW
0280  0856  20 BC F7                JSR CHKOUT
0281  0859  20 D2 FF                JSR BSOUT
0282  085C  20 CC FF                JSR CLRCHN
0283  085F  20 83 F1                JSR UNLSN
0284  0862  A0 02                   LDY #$02        ; DO TWICE
0285  0864  D0 A3                   BNE WG220B
0286  0866                  ;
0287  0866                  ;CLOSE FLOPPY AND RETURN
0288  0866                  ;
0289  0866  20 CC FF        WG230  JSR CLRCHN
0290  0869  A9 0E                   LDA #14         ;CLOSE FLOPPY
0291  086B  20 AE F2                JSR FCLOSE
0292  086E  68                      PLA             ;CLEAN UP THE STACK
0293  086F  68                      PLA
0294  0870  4C 89 C3                JMP READY       ;RETURN "READY"
```

```
0296  0873
0297  0873
0298  0873
0299  0873  A9 00
0300  0875  85 96
0301  0877  85 9D
0302  0879  20 22 F3
0303  087C  A5 96
0304  087E  29 10
0305  0880  D0 28
0306  0882  AD 84 F3
0307  0885  30 06
0308  0887  E6 C9
0309  0889  D0 02
0310  088B  E6 CA
0311  088D  A5 CA
0312  088F  85 2B
0313  0891  A5 C9
0314  0893  85 2A
0315  0895  20 72 C5
0316  0898  20 42 C4
0317  089B  A5 B3
0318  089D  C9 2F
0319  089F  D0 03
0320  08A1  4C 89 C3
0321  08A4  20 A7 C5
0322  08A7  4C C4 C6
0323  08AA  4C E6 F3
0324  08AD
```

```
;
; LOAD A FILE
;
LOAD    LDA #0
        STA SATUS          ;CLEAR STATUS
        STA VERCK          ;LOAD NOT VERIFY
        JSR LD15           ;LOAD A PROGRAM
        LDA SATUS
        AND #SPERR         ;CHECK STATUS (EOI OK)
        BNE LDERR
        LDA $F384          ;CHECK FOR (-04) ROM
        BMI LOAD1          ;NOT (-04)....
        INC EAL            ;FIX THE LOAD (-04) ROM
        BNE LOAD1
        INC EAH
LOAD1   LDA EAH            ;SET BASIC'S POINTERS
        STA VARTAB+1
        LDA EAL
        STA VARTAB
        JSR RUNC           ;FIX POINTERS
        JSR LNKPRG         ;FIX LINKS
        LDA FLAG           ;CHECK FOR LOAD OR RUN
        CMP #'/            ;LOAD ?
        BNE WG300          ;NO...
        JMP READY          ;LOAD RETURN TO BASIC
WG300   JSR STXTPT         ;SET TXTPTR FOR RUN
        JMP NEWSTT         ;RUN PROGRAM
LDERR   JMP LD209          ;PRINT "LOAD ERROR"
CMDEND
```

```
0326  08AD
0327  08AD
0328  08AD
0329  08AD
0330  08AD
0331  08AD  A5 34
0332  08AF  18
0333  08B0  E9 A0
0334  08B2  85 34
0335  08B4  A5 35
0336  08B6  E9 01
0337  08B8  85 35
0338  08BA
0339  08BA
0340  08BA
0341  08BA  A0 01
0342  08BC  A9 00
0343  08BE  85 C7
0344  08C0  A9 07
0345  08C2  85 C8
0346  08C4  A5 34
0347  08C6  85 5C
0348  08C8  A5 35
0349  08CA  85 5D
0350  08CC  B1 C7
0351  08CE  91 5C
0352  08D0  C8
0353  08D1  D0 F9
0354  08D3  E6 5D
0355  08D5  E6 C8
```

```
;THIS ROUTINE POKES TOP OF MEMORY
;DOWN RELOCATES THE PARSER AND
;SETS THE WEDGE
;
POKE    LDA MEMSIZ         ;POKE TOP DOWN
        CLC                ;MINUS ONE
        SBC #<CMDLN
        STA MEMSIZ
        LDA MEMSIZ+1
        SBC #>CMDLN
        STA MEMSIZ+1
;
;MOVE THE CODE
;
MOVE    LDY #$01           ;SET UP FROM ADDR
        LDA #<CMD
        STA SAL
        LDA #>CMD
        STA SAH
        LDA MEMSIZ         ;SET UP TO ADDR
        STA ORBTOP
        LDA MEMSIZ+1
        STA ORBTOP+1
MOV1    LDA (SAL),Y        ;RELOCATE
        STA (ORBTOP),Y
        INY
        BNE MOV1
        INC ORBTOP+1
        INC SAH
```

```
0356  08D7  A5 C8           LDA SAH
0357  08D9  C9 08           CMP #>CMDEND
0358  08DB  F0 02           BEQ MOV2
0359  08DD  B0 04           BCS WEDGE
0360  08DF  A0 00     MOV2  LDY #0
0361  08E1  F0 E9           BEQ MOV1
0362  08E3                 ;
0363  08E3                 ;WEDGE INTO BASIC
0364  08E3                 ;
0365  08E3  A9 4C     WEDGE LDA #$4C          ;JUMP INSTRUCTION
0366  08E5  85 70           STA CHRGET
0367  08E7  A4 34           LDY MEMSIZ
0368  08E9  A6 35           LDX MEMSIZ+1
0369  08EB  C8              INY
0370  08EC  D0 01           BNE WEDGE1
0371  08EE  E8              INX
0372  08EF  84 71     WEDGE1 STY CHRGET+1
0373  08F1  86 72           STX CHRGET+2
0374  08F3  60              RTS
0375  08F4                  .END

  ERRORS = 0000
```

SYMBOL TABLE

SYMBOL	VALUE						
ACPTR	F18C	BASIN	FFCF	BSOUT	FFD2	BUF	0200
BUMP	0760	CHKIN	F770	CHKOUT	F7BC	CHRGET	0070
CHRGOT	0076	CIOUT	F16F	CLRCHN	FFCC	CMD	0700
CMDEND	08AD	CMDLN	01AD	CNTDN	00BA	CR	000D
DFLTO	00B0	DODIR	079A	EAH	00CA	EAL	00C9
FA	00D4	FCLOSE	F2AE	FLAG	00B3	FNADR	00DA
FNLEN	00D1	FOPEN	F524	GRBTOP	005C	LA	00D2
LD15	F322	LD209	F3E6	LDERR	08AA	LINPRT	DCD9
LISTN	F0BA	LNKPRG	C442	LOAD	0873	LOAD1	088D
LOADB	0805	MEMSIZ	0034	MOV1	08CC	MOV2	08DF
MOVE	08BA	NEWSTT	C6C4	NOMAIN	074B	NOTDIR	0750
OPENI	F466	PIAK	E812	POKE	08AD	PRT	E3D8
RDERR	0774	READY	C389	RUNC	C572	SA	00D3
SAH	00C8	SAL	00C7	SATUS	0096	SECND	F128
SKIPB	080B	SPERR	0010	SPMSG	F315	STOP1	F301
STXTPT	C5A7	TALK	F0B6	TMP2	00FD	TWAIT	F8E6
TXTPTR	0077	UNLSN	F183	UNTLK	F17F	VARTAB	002A
VERCK	009D	WEDGE	08E3	WEDGE1	08EF	WG100	0707
WG110	0722	WG115	073D	WG120	076E	WG130	0791
WG140	0784	WG220	07CE	WG220B	0809	WG230	0866
WG235B	0807	WG240	084C	WG250	0811	WG255	0845
WG300	08A4	WG997	0748	WG998	0797	WSW	00B3

END OF ASSEMBLY

6502 MICROPROCESSOR ASSEMBLER FOR CBM PET 2001

ASMPAC8 is a powerful combined machine code and Basic Assembler program for MK 1 8K PETS. ASMPAC8 includes a TEXT EDITOR an ASSEMBLER and a DISASSEMBLER with a host of useful features to run in 7167 BYTES FREE. The Assembler will (1) Test Assemble to allow errors to be found (2) Assemble directly into free memory or (3) Assemble object code files for later processing by AUTOLOAD8 or AUTOSTRINGS8. ASMPAC8 is an ideal tool for beginners as the Test Assembly facility allows errors to be detected and corrected immediately with the Editor. ASMPAC8 allows the more experienced programmer to produce programs rapidly as the use of Files for Assembly Text is optional for short programs.

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ASMPAC8 and it's support programs are RECOMMENDED BY CBM.

Book Review

"6502 APPLICATIONS BOOK" by Rodney Zaks

This book starts where "Programming the 6502" (reviewed in Issue No. 6) left off. Rodney Zaks is a well respected author of computing publications and has had considerable experience in training newcomers to the field.

The "6502 Applications Book" deals with all the Input/Output associated with 6502 based systems. As such, the book is particularly relevant to Pet users who wish to interface peripherals and 'home grown' devices to their computer.

A large amount of space at the beginning of the book is devoted to explaining the intricacies of the various support chips manufactured for the 6500 range of micro-processor. These include PIO's such as the 6520 for handling parallel data complete with hand shaking, and the more advanced Versatile Interface Adaptors like the 6522 which contains two programmable timers and a Shift Register for converting between serial and parallel data. The principles and operation of these devices are explained in detail from absolute basics and the text is interspersed with numerous diagrams, and worked examples. In addition there is a large number of test questions enabling you to keep a check on your understanding of each new concept.

The rest of the book deals with the practical side of interfacing and is illustrated with several diverse applications including; a traffic control system, a burglar alarm, a music generator and many others. All the assembly language routines (an understanding of A.L. programming is a pre-requisite) are written in a machine-independent form, for ease of application.

If you intend to interface any device to your Pet, or simply want to learn how a system like the Pet works internally, then this is probably one of the best books available on the subject.

The "6502 Applications Book", as with the previous book, is published by SYBEX and should be obtainable from your nearest computer bookshop.

* * * * * * * * * * * *

"BASIC COMPUTER GAMES" Edited by David H. Ahl

As the title suggests, this is a collection of computer games written in BASIC. The games come from 'Creative Computing' and have been collected and adapted largely by David Ahl (founder and publisher of C.C.). As all the programs are written in Microsoft 8K Basic they are completely compatible with the Pet and the listings can be entered straight into the keyboard and recorded for later use.

The book contains 101 games in total, ranging from old favourites including Lunar Landing and various card games, to some refreshingly original games such as Animal, and Poetry. On the whole, the games tend to be of the static type, requiring mental judgement rather than just reactions. The listings and documentation are presented in a tidy manner and on the whole, are unambiguous. A large number of anthropomorphic computer cartoons gives the publication an informal and 'friendly' image.

On the negative side, most of the listings could have been made considerably more efficient without loss of clarity. I found, however, that the programs were relatively easy to compress when entering them into the Pet - saving time and memory space. Also, Pet's graphic capabilities enable several of the games to be made more visually interesting with a little extra work.

Having said that, the book represents very good value for money at a published price of £4.50. It is distributed in the U.K. by:-

Transatlantic Book Service Limited
24 Red Lion Street
London WC1R 4PX.

* * * * * * * * * *

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Printout

1 Sorting Techniques Continued.

Several people have written to me following my re-publication of the SHELL-METZNER sort. All have pointed out that the QUICKSORT, by Hoare, is even quicker than the SHELL.

Working on the principle that it is easier to sort two small arrays rather than one large one, it chooses an element, and splits the array in two, placing smaller elements earlier and larger elements later in the array than the chosen element. It then operates on each of the smaller arrays in exactly the same way. Rather like a clerk sorting manualy into smaller and smaller piles, the routine eventualy produces sub-arrays which are in order and contain only one or two elements each. One final exchange in the case of the two element sub-array produces the sorted data.

QUICKSORT likes jumbled data. On average the sort time for N elements will be proportional to N*LOG(N). The time for the SHELL will be N to the power 5/4 and for the Bubble, N squared - on average.

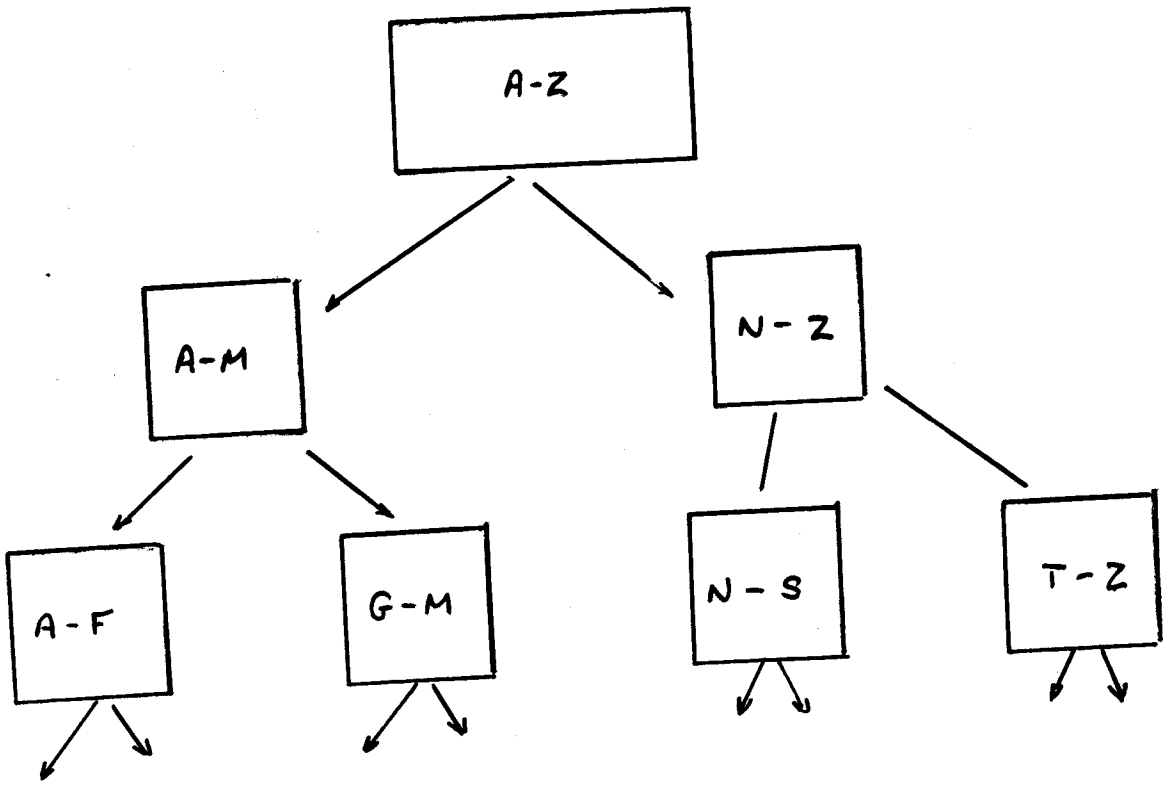
Hoare suggests choosing the first element as the comparison item. However, when the array is ordered or nearly so, most other elements get placed on one side of it, creating a very small and a very large sub-array. In this case sort times approach that of the Bubble sort. One answer suggested by Harrington is to choose the middle array element for comparison. This works fine for ordered arrays but not for two ordered arrays joined end to end. He suggests that choosing an element at random is the way out of this problem.

You will see that where you are looking for the quickest way to sort data, it is necessary to consider the nature of that data and depending on how it is arranged, chose a suitable routine. If you cant predict the nature of the data, then probably the best compromise is the SHELL.

The following listing is taken from Harrington's article in "Micro Computing."

```
 95 REM SET ARRAY SIZE
100 LET M=N
105 REM SET SPACING BETWEEN LIST MEMBERS
110 LETM=INT(M/2)
115 REM SEE IF DONE
120 IFM=0THEN300
130 LETJ=1
140 LETK=N-M
145 REM I & L INDICATED ELMNTS TO BE MERGED
150 LETI=J
160 LETL=I+M
```

```
165 REM PERFORM MERGE
170 IFA(I)<A(L)GOTO240
180 LETT=A(I)
190 LETA(I)=A(L)
200 LETA(L)=T
210 LETI=I-M
220 IFI<1THEN240
230 GOTO160
235 REM MERGE NEXT TWO ELEMENTS
240 LETJ=J+1
250 IFJ<=KTHEN150
255 REM BEGIN MERGE OF RESULTANT LISTS
260 GOTO110
300REM END OF SORT
```



DIAGRAMATIC REPRESENTATION OF 'QUICK SORT'

2. Symbolic BASIC 'assembler'.

2.1 Processing a 'listed' BASIC text.

In the last issue, I described a method of processing BASIC listed text on tape to produce a formatted listing. The technique can be extended to actually change the text contents, which can then be fed back into the memory as a proper but amended program using our old friend, the Templeton-Butterfield merge.

It is not a straightforward matter to change for example all occurences of the variable T to become variable V, because of the problems in distinguishing variable T from variable CT or even PRINT.

2.2 A personal computer language.

A solution to the problem is to head each variable you type in with a special character such as ! which is not part of the normal BASIC syntax. The function of this header character is to say "here is the start of a variable.

This means that what you type in is not BASIC but will have to be converted using an 'assembly' program.

Taking matters further, one can type in explicit variable names headed by ! and ending with a space say, which BASIC cannot differentiate but your assembler program can. For example, one can use such variable names as !PAYNET , !PAYGROSS , and even !PAYDEDUCTIONS , which BASIC would either see as variable PA or complain because it finds the reserved word 'TI' or 'ON' hidden inside the name.

The way an assembler handles these psuedo variables is to create a table of true variable assignments, allocating real variable names A - ZZ as it meets each new psuedo- variable.

When the program has been assembled onto a tape or disk file, your assembler can then print out this table sorted into both psuedo and real variable order. Such a printout makes an excellent addition to the program documentation.

For example

Psuedo text

```
10 FOR !INDEX =!START TO!FINISH
20 PRINT!NAMES$ (!INDEX)
30 NEXT
```

becomes

```
10 FORA=BTOC
20 PRINTA$(A)
30 NEXT
```

and the printed tables are

```
A=INDEX              FINISH=C
A$=NAMES$            INDEX=A
B=START              NAMES$=A$
C=FINISH             START=B
```

2.3 Jump to labels.

Taking the idea yet one more step, one can overcome the problem of having to type in GOTO, GOSUB and THEN without yet knowing what line number you are going to jump to.

The idea is to use label references and labels again headed by special characters, perhaps \ and '.

Again a table is formed of all labels and their line numbers. A second pass picks up label references and converts them to line numbers using the table.

For example

Your text

```
10 \START
20 INPUT"NUMBER 10 OR LESS";!NUMBER
30 IF!NUMBER >10THEN'ERROR
40 ?"YOUR NUMBER WAS 'OK'":END
50 \ERROR
60 ?"YOUR NUMBER WAS TOO HIGH
70 GOTO'START
```

would assemble as

```
10 REM START
20 INPUT"NUMBER 10 OR LESS";A
30 IFA>10THEN50
40 ?"YOUR NUMBER WAS 'OK':END
50 REM ERROR
60 ?"YOUR NUMBER WAS TO  HIGH"
70 GOTO10
```

And once again your assembler would produce reference lists

```
ERROR 50             10 START
START 10             50 ERROR
```

Be warned that such assembly using tape and GET# is not fast and that your keyed in programs cannot be tested until they are assembled. However you will get considerable pleasure and satisfaction creating your own personal programming language and with large programs the technique may have some practical value.

3. BASIC competition number 4 "Wardrobe Removal"

This problem simulates one faced by those burly gentlemen who help you move house.

Write a BASIC program which asks for the dimensions of a box (right angled), then the height and width of a corridor and finally tells you whether the box will go round a right-angled turn in that corridor.

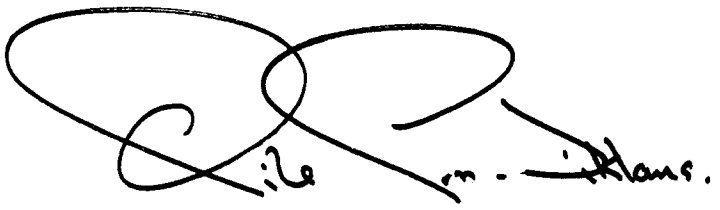
Entries will be judged on REM annotation as well as execution time. The winner will get £10 of Commodore software. Entries to me within 21 days of the official publication date of this issue please.

4. Results of BASIC competition number 3, "ARRAY ARRAY".

Yet again the formidable Mr J Clark of Watford emerges as the winner of competition no 3, closely followed by Mr K.D Armstrong of Edinburgh.

Mr Clark again provided copious notes. He developed the sort routines himself and came to the same type of solution as Hoare and Harrington.

```
   1 I=0:Q=0:P=0:J=0:K=0:S=0:
   2 N=255:DIMa(N),M(N),1(N),B(N)
2000 GOSUB3000:FORI=1TON:L(I)=A(P):
     A(P)=B(P):P=M(P):NEXT
2010 GOSUB3000:FORI=1TON:B(I)=A(P):P=M(P):NEXT
2020 FORI=1TON:M(I)=B(I):NEXT
2030 J=1:K=1:FORI=1TON:P=L(J):Q=M(K):
     IFP<QTHENA(I)=P:J=J+1:NEXT:GOTO2050
2040 A(I)=Q:K=K+1:NEXT
2050 J=N:K=N:FORI=NTO1STEP-1:P=L(J):Q=M(K):
     IFP QTHENB(I)=P:J=J-1:NEXT:GOTO2070
2060 B(I)=Q:K=K-1:NEXT
2070 RETURN
3000 F=-15
3010 F=F+16:GOSUB4000:P=S:F=F+16:GOSUB4000:
     Q=5:GOSUB5000
3020 IFF=17ORF=81ORF=145ORF=209THENX=P:GOTO3010
3030 Q=X:GOSUB5000:IFF=49ORF=177THENY=P:GOTO3010
3040 Q=Y:GOSUB5000:IFF=113THENZ=P:GOTO3010
3050 Q=Z:GOSUB5000:RETURN
4000 S=F:M(F)=0:FORI=F+1TOF+15+(F=241)
4010 K=A(I):Q=I-1:IFK<A(Q)THEN4060
4020 J=M(Q):IFJ=0THENM(I)=0:GOTO4050
4030 IFK>A(J)THENQ=J:GOTO4020
4040 M(I)=J
4050 M(Q)=I:NEXT:RETURN
4060 Q=S:IFK>A(Q)THEN4020
4070 S=I:M(I)=Q:NEXT:RETURN
5000 I=P:IFA(Q)<A(I)THENP=Q:Q=I:I=P
5010 J=M(I):IFJ=0THENM(I)=Q:RETURN
5020 IFA(Q)<A(J)THENM(I)=Q:I=Q:Q=J:GOTO5010
5030 I=J:GOTO5010
```



Petbits

A new training course entitled "MICROCOMPUTERS - Applications and Programming" is to be run at the Coventry Management Training Centre. Aimed primarily at businessmen, the course aims to demonstrate the capabilities of microcomputers and teach a working knowledge of BASIC, with hands-on experience on Commodore PETs.

The course lasts for three days (5th - 7th November 1979) and consists of lectures, demonstrations and teach-ins by qualified staff. The basic fee is £138.00 for the three days, including lunches and 15% VAT; hotel accomodation can be arranged at extra cost.

Although a large number of machines will be available on the course, we are advised that anyone able to bring his own PET will be eligible for a discount. For more information ring: 0926 36621.

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NEW ENTRIES TO USERS DIRECTORY:

Gordon Bell
55 Belvedere Road, Hessle, Humberside. Tel: 0482 645724
Training,Consultancy and programming services.

Tina Björnstjerna Datatjänst
Brantingsgatan 50, S-115 35 Stockholm, Sweden.
Hardware, software for Pet.

J. E. Atlas
A De B Consultants, 3 Cromwell Place, London SW7.
Mechanical, Electrical, Civil, Structural Engineering.

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The States-originated publication 'CURSOR', is now available in the U.K. through PETSOFT. Cursor comes on a C30 cassette, 10 times a year. At least five full size programs come on each cassette with one or more games programs that could be worth £8 elsewhere. None of the programs have previously been published in the U.K. In addition to the cassette the subscription includes CURSOR NOTES which cover the documentation for the programs and other Pet-related information.

One year's subscription to CURSOR costs £36.00 (£45.00 for overseas airmail). A sample issue may be obtained for £4.00 including p.& p. For more information telephone: 021 455 8585.

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